Pischel takes exception to my statement, "that a competent man can only do good in mastoid surgery." I will answer this by saying that I have never seen the facial nerve cut. I have seen the dura uncovered and punctured, if you please, the sinus uncovered and accidently opened, but I have never seen a serious complication nor a complication of anv kind, as the direct result of the operation. I have seen acute cases of mastoiditis die because they have not been operated upon early enough, but from no other reason. The deaths that come from anesthesia have nothing to do with the operation at all. That is entirely foreign to the subject. In a two years' service in the Politzer Clinic, there were about forty-five deaths. The lesions were always found to be in the brain or its membranes and from delayed operation in either the acute or the chronic condition. One gentleman spoke of a fatal case on the third day from cerebral complications. This again illustrates the very points that I have tried to emphasize. I am confident that had this case been examined carefully, and conditions looked for that I have spoken of, the case would not have been sacrificed.

PLAGUE.

Being a translation of the Fourth Chapter of "La Pathologie Exotique," by Professor A. Le Dantec of the Faculty of Medicine, Bordeaux.

Translated for the State Journal by Dr. W. C. RUCKER, P. A. Surgeon, U. S. P. H. and M. H. S.

(Note.—In sending the manuscript, Dr. Rucker writes as follows: "I am sending you herewith a translation of the fourth chapter of Le Dantec's 'La Pathologie Exotique.' This is not a finished production inasmuch as it is the product of the few moments of recreation which have been allowed me in the past few months. It contains so much of interest, especially to the physicians of California, and is in such agreeable style that it seems to merit publication in your journal." It is indeed a most valuable contribution to the subject of plague and therefore no apology is made for its length; it should be carefully studied by every physician in this state. Ed.)

Synonyms: Bubonic plague; peste a bubons; typhus of the Orient; levantine fever; pest; in Chinese Yang-tse or lao-chow-ping (disease of rats).

From the bacteriological viewpoint, plague should be considered as a true septicaemia caused by a specific cocco-bacillus. From the clinical viewpoint, it is a febrile disease characterized by a most pronounced typhoid state and by the development of buboes, carbuncles and petechiae.

History.

1. The Plagues of the Ancients. The ancients called all the diseases, which affected them in epidemics and caused a considerable mortality, plague. The disease, which raged at Athens in 430 and which is known in history by the name of "the plague of Athens," was not true plague. It is the same as the plague of Antonin, which ravaged Europe and Asia at the time of Marcus Aurelius (166 B. C.), and of the plague of Carthage which attacked Egypt, the coast of Africa, Italy and Greece from 255 to 265 and which has been so well described by St. Cyprien. These three epidemics or plagues called by the ancient word seem to have all been the same affection, which, according to Littré, seems to have disappeared from the surface of the globe as its symptoms are not like any other disease which exists to-day.

2. The True Plague of the Ancients. The true plague seems to have been known in Egypt before the Christian era. A manuscript of Oribase, dating from 200 to 300 years before Christ, speaks of a disease characterized by a violent fever, pains, and an eruption of large, hard buboes.

3. The Plague from the Christian Era to Our Days. The first epidemic of plague which has been registered in an authentic manner is known under the name, "Plague of Justinian" (542). It has been described by Evagrius and Procape. Starting at Péluse, on the delta of the Nile, one flank of it penetrated Persia while the other ravaged all the seaboard of the Mediterranean.

The greatest epidemic which has been let loose upon humanity is the plague known in history as the black pest. It left China about 1334, and marching from East to West it invaded successively, India, Persia, Russia, Germany, France, Italy, Spain, and finally England and Norway (1347-1351). This epidemic carried off twenty-five millions of the inhabitants of Europe, which at that time amounted to one hundred and five millions. Pope Clement VI, who made a vast inquiry into the ravages caused by the scourge, fixed the figures of the deaths caused in the entire world at 42,836,486. Also what a profound impression this epidemic left on all the writings of the period. They accused the Jews of having poisoned the wells, using therefor a mixture composed of spider webs, the blood of the buboes and animal poisons. This accusation served for a pretext for those terrible persecutions, which cost the lives of thousands of the Israelites. This plague of the fourteenth century was the beginning of the rule of quarantine. The disease perpetuated itself in an endemic state in Europe up to the sixteenth century, when it yielded its place to typhus and typhoid fever, it being thought that it divided itself to create these two diseases (Nully).

During the seventeenth century one notes first, the plague of Marseilles (1720); the plague of Messina (1743), and finally the plague of Moscow (1770).

The plague of Marseilles has remained celebrated in history because of the self-sacrifice which was displayed by Bishop Bulzunce during the time of the epidemic.

At the end of the eighteenth century and the beginning of the nineteenth, Egypt was a permanent focus of plague. From 1783 to 1844, twenty-one epidemics occurred. Of these we are more interested, from a historic point of view, in the epidemic of 1799, which caused the death of two thousand men of the French army in Egypt and Syria at the siege of St. Jean d'Acre (Desgenettes). This succession of epidemics in Egypt made it believed that this country was the original focus of the disease, and the search for the explanation brought forth many theories, the most seductive of which were the theories of the three deltas and the theory of Pariset.

The theory of the three deltas gives for a focus of origin of each pestilential disease, the delta of a great river.

1. The delta of the Nile (plague);
2. The delta of the Ganges (cholera);
3. The delta of the Mississippi (yellow fever).

The theory of Pariset blames the existence of plague in Egypt to the changes which have been produced by the civilization of that country. During all the period of antiquity in which the Egyptians embalmed or salted their cadavers to preserve them, there occurred no epidemic of plague but when these practices were abandoned it raged.

Reckoning from 1850, it seemed that plague was going to be relegated to the domain of history, but in 1878-1879 the epidemic of Wetlianka knocked at the doors of Russia. But this is not what makes one alert, it is by way of the sea that plague penetrates Europe.

The endemic focus of Yunnam awoke sharply in

1894, and began its irradiations to Canton and Hongkong, reaching Bombay in 1896, where it formed a great secondary focus. Beginning from this point the epidemic transported itself a little bit everywhere; Mauritius, 1899; La Réunion, 1899; Tamatooe, 1898-1899; Australia and New Caledonia.

Egypt has been fortunate. Europe, however, was not free from these incursions. Oporto was severely stricken, and London and Marseilles succeeded in smothering the epidemic in the ships and hospitals. In the meantime, quite recently (August, 1903) plague was landed in the suburbs of Marseilles with a cargo of rags for the pasteboard manufactory of St. Barnaby. The rags proved to be from Bombay. Fortunately, the epidemic was quickly checked, for, as we shall see in the following, we actually have at our disposition the efficacious means of protecting ourselves against the terrible scourge.

At present the plague is making an extraordinary expansion lit up by the South African war. The direct relations between India and the Cape of Good Hope multiplied this, and plague debarked many times in South Africa.

The epidemic finally, by crossing the Atlantic, attacked for the first time Argentine, Paraguay, Brazil, etc. One sees by this simple enumeration how much the plague has seized in an offensive movement covering a dozen years.

4. Laboratory Epidemics. It is not only the sides of ships that bear the epidemics of plague, occasionally culture tubes, handled imprudently, spread the plague virus in the laboratory and give rise to local epidemics. It was thus that two laboratory directors were killed, the one in Vienna, the other in Berlin, victims of their imprudence. The laboratory of Nha-Trong has been wrongly accused of having spread the plague in the neighboring villages. Yersin has demonstrated that the disease was imported into the country by the Chinese junks going between Canton and Pakhoi.

Foci of Plague.

The original foci of plague seem to be situated in the massive mountains at the north of India and at the southwest of China, principally at Guhrwal and Yunnam, but the various epidemics of plague which have ravaged the world have left in their wake secondary foci, where the disease breaks out from time to time.

We must consider, then, two kinds of foci; the primary foci and the secondary foci.

1. Primary Foci. (a) Indian Foci. The Indian foci are two in number: first, Guhrwal; second, Pali; separated from one another by seven or eight hundred miles of intervening country which does not present a single case of plague. Guhrwal appears to be the primary focus of plague in India, while Pali seems rather to be a secondary focus. The plague in Pali presents one peculiarity worthy of note; it is frequently accompanied by hemoptysis and inflammation of the lungs. These complications were especially noted in the black plague of the fourteenth century.

The plague which blazed forth in Bombay in 1896 and which is not yet extinguished seems to have been imported by a vessel coming from China loaded with infected merchandise. The epidemic commenced in the quarter Mazagon, near the docks and harbor.

(b) Chinese Focus. The province of Yunnam is a permanent plague focus, which constantly menaces China and Tonkin. China is constantly invaded from Pakhoi and Lieuchu. In 1894, plague was carried from Pakhoi to Canton, where it had 180,000 victims; next at Victoria, capital of Hongkong, it carried off 12,000 Chinese in the native quarter. The disease was preceded by a great mortality of rats and mice. It was during the epidemic of Hongkong that Yersin discovered the pathogenic microbe of plague.

2. Secondary Foci. (a) Tripoli. Plague made its appearance in 1856 in the Arab tribes near Bengazi, and lasted three years. In 1876 a new epidemic occurred at Cyrenaique.

(b) Assyria. Assyria is a mountainous district situated at the south of Hedjaz and Arabia. Its proximity to Mecca causes the fear of the propagation of plague among the Mohammedan pilgrims, who serve as agents for its dissemination to all parts of the world.

(c) Irak-Arabi. This is the ancient Mesopotamia of the Greeks and the Al Djezireh of the Arabs. This province contains two sacred cities, Kerbela and Nedjef, where the tomb of Allah is situated and where the natives take their cadavers for interment. In 1874, after the famine which devastated Persia, there were 12,202 cadavers transported from Persia to Mesopotamia (Reclus). According to Tholasan, Mesopotamia always presents certain sporadic cases of plague regardless of an epidemic. It was from this focus that plague invaded Persia in 1877, next Rescht and finally Astrakhan and Wetlianka (the plague of Wetlianka, 1878-1879). Europe was preserved from the scourge owing to the energetic measures taken by Count Louis Melikoff, who surrounded the stricken localities by a triple sanitary cordon and burned the effects and the houses of the infected. Recently, in 1898, plague appeared at Anzab (Turkish Russia). The sanitary measures taken by the Russian government were again successful in stamping out the scourge.

(d) Uganda. This is a province of English East Africa, situated below the equator, between Lake Albert and Lake Victoria. This focus has been described recently by Koch, who sent a German physician, Zupitza, who confirmed by his microscopic researches the diagnosis made by the missionaries of Uganda. When they actually connect Lake Victoria with Mombasa on the Indian ocean as a line of travel as the English sought a communication between Uganda and the Nile in their last campaign against the Dervishes, this new African focus of plague should be considered a danger to Europe.

3. Bacteriology of Human Plague. (1) Priority of the Discovery of the Plague Bacillus. It is generally believed in France and Europe the specific microbe of plague was discovered simultaneously by Kitasato and Yersin during the epidemic of Hongkong in 1894. The communication of Kitasato was made on July 7, 1894, while that of Yersin was made on the 30th of July of the same year. It seems logical to conclude that the honor of the discovery belongs by right to the Japanese scientist. That is not the case, however, for the two authors have described a different microbe, and it is to-day proven that the bacillus of Yersin is truly the specific microbe.

If the truth has taken so many years to come to light, it is because it was thought for a long time that the two authors had studied the same microbe and that which contributed much to the continuation of the error in medical opinion is the fact that in the extreme Occident we possessed only the cultures of the bacillus of Yersin, while in the extreme Orient the Japanese scientists worked with cultures of the bacillus of Kitasato. The light has litt'e by little cleared up this point in the bacteriological history of plague, thus resulting in the publication of a work, in the "Archives of Naval Medicine," by a physician in the Japanese navy, Dr. Tatsusbaro Yabe. We render homage to the scientific honesty of our Japanese colleague, who acknowledges with great sincerity the error of his scientific compatriot.

Kitasato has determined from the underlying principle of many diseases that when there is a polymicrobic local infection the general circulation is

not invaded by the specific microbe. Kitasato chose the blood for isolating the specific microbe, thinking that since the pus of the buboes was polymicrobic the blood only contained the microbe in pure culture. But what is true of one disease is not always true of another, and it was found that the microbe isolated from the blood of plague patients by Kitasato is not the true specific organism but really a microbe of secondary infection.

Yersin took as a point of departure for his researches an altogether different principle. The characteristic lesion of plague being the bubo, it is in the bubo that one should find the specific microbe. He isolated therefrom the true micro-organism of plague.

To make it easier to realize the error into which Kitasato has fallen, and to give justice to the view of Yersin, let us take as an example a well-known microbic disease, diphtheria. In diphtheria the characteristic lesion is the false membrane, and it is there that one finds the microbe of Laeffler, which multiplies locally without generalizing itself, but in certain mortal cases of diphtheria one finds in the blood a secondary microbe, the strepto-coccus. Kitasato addressed himself to the blood for isolating the specific organism and recovered a secondary organism. It is well to make known these scientific errors in order to avoid their repetition.

The two organisms offer characteristics so totally different that their differentiation does not offer the slightest difficulty. Here are some of the characters, which enable one to distinguish between them at first glance:

Bacillus of Yersin.

1. Immobile;
2. Does not take Gram's;
3. Does not take milk;
4. Does not cloud bouillon and forms clumps on the sides of the tube.

Bacillus of Kitasato.

1. Mobile;
2. Takes Gram's;
3. Coagulates milk;
4. Clouds boullion.

In the plague of the extreme Orient the bacillus of Yersin and that of Kitasato live side by side, and as noted by Aayama the bacillus of Yersin predominates in the glands while that of Kitasato predominates in the blood. It is not the same in the plague of other regions. Thus, in India, the plague is pure—that is to say, without microbic association. We have ascertained the same purity of the plague at Reunion in a number of smears which our comrade. Dr. Vassal, has obligingly furnished us with (pus from the glands, blood, kidneys, etc.).

It remains to determine the exact nature of the microbe of Kitasato. Is it a streptococcus as according to the view of Aayama? Is it a variety of the pneumococcus as is thought by Tatsusaburo? Is it a variation of the bacillus studied only by Kitasato? Everyone with good reason knows that it cannot be said that the secondary infection is always caused by the same organism. On the contrary, the specific infection is always the same; it is due to a bacillus, which has been apparently without contest by Dr. Yersin.

(2) Isolation of the B. Pestis from Human Pathological Products. For the study of the morphology, the staining and the culture of the pest bacillus, also its action on various animals, it is necessary first to procure a pure culture of the bacillus of Yersin. In man one recovers the plague bacillus:

(a) From the gland in the bubonic form;
(b) From the sputum in the pneumonic form;
(c) From the blood in the septicemic form.

From the Gland. One withdraws by means of a Provatz syringe a little of the serum or pus from the parenchyma of the gland, or one may make a little puncture with a bistoury and draw out the glandular serum with a Pasteur pipette. One spreads this serum upon the surface of a tube or plate of agar, and leaves the tube or plate at room temperature of from 15° to 18° Centigrade. The colonies upon agar are white and small. Their center becomes opaque and yellowish. One assures himself that these are plague colonies by the negative coloration by Gram's method, by the culture on bouillon and by inoculation into guinea pigs from which in a moment we determine the peculiarities. One has thus a pure culture of the bacillus of Yersin. It is wise to isolate first of all on agar and not directly into the bouillon, for the gland does not always contain the plague bacillus in a pure state. When suppuration has been well established it contains many staphylococci and few pest bacilli.

In the Sputum.—It is especially in the pneumonic form that one should address himself to the sputum to isolate the pest bacillus. One chooses if possible a sanguinolent sputum and subjects it to the same manipulations as with the serum or the pus from the buboes. It contains the plague bacilli in great abundance.

In the Blood.—The bacillus of plague is absent from the blood at the beginning of the disease and it remains absent except in rare cases of great severity but if the disease takes on a grave aspect it is indicated by the bacilli making their appearance in the systemic circulation. In all fatal cases one finds the plague bacilli in the blood twenty-four hours before death. We have here an analogy to the conditions found in man in malignant pustule. The bacillus of anthrax is first localized in the vicinity of the pustule and finally invades the circulatory system and produces death.

Calvert in Manila has sought to discover at what moment one finds the bacillus of plague in the blood in fatal cases. In thirty-two cases he found the bacillus of plague in the blood:

In one case, 120 hours before death.
In two cases, 96 hours before death.
In five cases, 72 hours before death.
In seven cases, 48 hours before death.
In the thirty-two cases, 24 hours before death.

Calvert has been able to follow step by step the evolution of the septicemia by examining smears from the blood; at the time of the beginning one never sees more than a few bacilli, sometimes but a single one, twenty-four hours later their number is increased very considerably and the blood becomes transformed into a veritable "purée of microbes" at a more advanced stage of the disease (Besredka).

The presence of the b. pestis in the blood does not always indicate a fatal prognosis. Calvert claims to have seen the plague bacillus in the blood of four persons who recovered. In one of the cases the microbe remained in the blood for forty-eight hours.

At the beginning of a case of plague during which time the bacilli are very rare in the blood, we advise the employment of the procedure so sensible which is to-day utilized in searching for the bacillus of Eberth in the blood of typhoids. One takes 1 c. c. of blood by puncturing a vein by means of a Pravatz syringe and one plants it in 500 c. c. of peptonized bouillon. By employing so great a quantity of blood there are greater chances of discovering the pest bacilli than by employing a single drop of the same fluid. Bouillon should contain flocculi and not be clouded, if the bacilli of plague are discovered in a pure culture in the blood.

Now that we have learned how to obtain a pure culture of the bacillus of Yersin, let us pass in review the various characteristics of this microbe.

Marphology of the Microbe of Plague.

The microbe of plague is a short, squatty bacillus, especially when it is found in the buboes, and a little longer when found in the blood. It stains easily with all the aniline dyes but does not take Gram's stain. The two extremities of the bacilli stain strongly and leave between them a central space which is more clear. It is therefore a spindle shaped microbe. Sometimes the bacilli seem to be surrounded by a capsule.

The microbes growing on a culture of gelatin have the aspect of short little sticks, especially when grown from the buboes, but in the middle of these short rods, one sees the round forms like cocci and the elongated forms which have sometimes given the name cocco-bacillus to the microbe of plague.

When grown on liquid media, the microbe forms itself in little chains like a strepto-bacillus.

The bacillus of plague is stained with all of the aniline colors **but it does not take Gram's.** This characteristic is important to remember, since by this alone it is possible to differentiate this organism from the ordinary microbes of suppuration, staphyllococci, streptococci, and pneumococci, all of which take Gram's. Also we advise the treating of all smears (pus, sputum, etc) with a double staining, Gram's eosin or dilute fuchsin.

For smears from the organs one should employ counter staining but in the inverse order, that is to say, staining first the field with eosin, and afterward, the microbes with methylin blue or violet.

A particular characteristic of the pest bacilli is their cultivation at laboratory temperature, that is to say, at 18° or 20°, rather than the temperature of the incubator.

The organism of plague may be grown upon all the media. Upon gelatin, the colonies are at first white and transparent, afterward their center becomes opaque and yellowish, and when one examines them, appear slightly swollen. The diameter of the colony always remains very small.

The organism of pest grows in bouillon or on water of peptone, 2 to 100. The growth upon these two media is similar to that of the streptococcus, i. e., floculi are formed upon the sides of the tube and does not cloud the bouillon.

The bacillus of plague grows in a characteristic fashion when cultivated after the method of Haffkine. This method consists in placing upon the surface of the bouillon after it has been sterilized, a little cocoanut oil or butter. After the culture has developed, one sees upon the inferior surface of the fatty droplets, flakes and stalactites. Care must be taken not to shake the tube lest one precipitate the flakes held in suspension.

The pest bacillus grows very slightly or not at all upon potatoes at the temperature of the incubator but at the temperature of the laboratory, 15° or 20°, it forms after four or five days a slight coating in the track of the culture. A second passage gives a pearly culture. (Lignieres.)

The bacillus of plague is a very fragile microbe. An exposition of a few moments to 58° is sufficient to destroy it. Sunlight acts in the same manner, but it requires an exposition of four hours to light irradiations to kill a culture. When the microbe is in an albuminous media (sputum, pus, etc.) it is thus protected and its resistance is much greater. Dessication kills it quickly if it is not in a protective albuminous media. All of the antiseptics employed in disinfection kill the pest bacilli in a few moments (corrosive sublimate, carbolic acid, permanganate of potash, chlorinated lime, etc.)

Vitality in Water.

Inghilleri has studied carefully the duration of survival of pest bacilli in distilled water and potable water to determine their adaptability to aquatic media.

(A) Survival in distilled sterilized water. At room temperature plague bacilli live from thirty to sixty days in sterilized water. If one places the flask containing the pest bacilli in the incubator at 35°, the survival is still longer,—60 to 75 days.

(B) Survival in potable water. The survival of pest bacilli is much less in ordinary drinking water than in sterilized distilled water. This is easily explained by the vital competition of the microbic flora of water which rapidly reaches suffocation and causes the pest bacilli to disappear. The latter does not disappear completely for about a month in this environment.

The best method consists of adding to the original culture the proportions growing in water. The bacilli lose their virulence, but when recovered, will revive at the end of five days. (Burnet.) In fact all the researches indicate that pest bacilli are not suited for life in water and resist during a short time but do not multiply.

Vitality in Grains and Rags.

This question is important to solve because grains and rags have been accused of transporting the contagion for great distances. The investigations should be made by spreading pure cultures upon various samples previously sterilized. Corn, peanuts, linseed, farina, rags of wool, cotton and linen which have been soiled with the saliva of virulent plague cases.

According to Hankin, the bacilli do not remain virulent on these substances for more than six days. It is necessary therefore to search for other things to explain the undeniable role played by grains and rags in the transmission of plague.

Vitality in Cadavers and Excrement of Rats.

Maassen, instead of using the method of cultures for revealing the presence of plague microbes in the viscera of rats dead from plague, has adopted the more reasonable method of animal inoculation. To this end he introduced beneath the skin of rats or guinea pigs fragments of the spleen, liver, and buboes which he wished to analyze. Plague was often found in the body of the inoculated animal when the culture of the suspected viscera did not furnish a single colony.

The fragments of pest tissue are then absolutely comparable to fragments of tuberculosis tissue. The growth and stain which is not found sometimes in Koch's bacillus in tuberculous products (white swelling, lupus, etc.) is found upon inoculation of a fragment beneath the skin of a guinea pig, thus demonstrating truly the tuberculous nature of these products.

It has been found that at a temperature of 20° the cadavers of plague rats are very virulent thirty days after death and that at a temperature of 8° the cadavers of plague rats preserve their virulence for at least fifty-three days.

In the excrement of rats fed upon the cadavers of pest rats the bacillus of Yersin preserves its virulence for a short time only; one day upon dried feces, four days when these materials have been preserved from desiccation. To study the vitality of the bacilli in these excrements, Maassen placed the suspected material upon the skin of a freshly shaved animal (Marie).

To sum up, all these experiments demonstrate that merchandise thought to be apt to propagate plague, such as rags and grains, are dangerous not because of their being soiled with the excreta of human plague, but because they serve as a refuge for rats suffering from pest and that upon the death of one, virulent plague bacilli are preserved in the viscera for a considerable time. The bacteriological conclusion is then, that we should make a relentless war upon the rat which is the specific vehicle of the disease.

Animal Inoculations.

Nearly all animals are more or less susceptible to plague, for it has been found that they may take the infection through cutaneous, respiratory and digestive channels.

(A) Cutaneous Route. All laboratory animals (squirrels, rats, guinea pigs and rabbits) are so susceptible to the pest virus that it is sufficient to prick them with a needle charged with the virus to cause in them a fatal case of plague. Here is the method of operation: to inoculate a squirrel or a rat one charges the point of a lancet with a fragment of a culture of pest bacilli or agar, and then pricks the animal in one of the hind feet, in imitation of the maneuver with which one inserts vaccine in the arm of a man, that is to say, by turning the lancet so as to remove the superficial layers of the skin. After a few hours the animal is dull, it limps,—a buboe appears in the glands on the corresponding side, and finally the bacilli are generalized throughout the entire lymphatic and vascular systems. At autopsy the bacilli may be recovered from all the viscera.

To cause plague in the guinea pig, it is sufficient to pluck out a few hairs and to smear the denuded surface with a culture. The animal then presents a local eschar (plague carbuncle) and very quickly succumbs. At autopsy one finds the spleen crowded with little yellowish bacillary foci recalling slightly the appearance of tubercles.

The rabbit should be inoculated by a subcutaneous injection or by spreading the pest virus upon the cutaneous surface denuded and irritated by a razor. In the latter case a sphacelus occurs at the point of inoculation. When one is dealing with a microbe of low virulence it is better to inject beneath the skin. Finally when one is searching for the organism from a fragment of the viscera of the cadavers of plague rats, it is better to introduce all the suspected fragment beneath the skin of a guinea pig or a rat, according to the method of Maassen.

Apes react very quickly to a subcutaneous inoculation as was demonstrated by the Russian Commission at Bombay. It is sufficient to inject beneath the skin of the arm a small quantity of the pest virus to see develop one or two days later edema at the point of inoculation, an axillary buboe, and a fever from 38° to 42° C. Death follows in three to five days. Apes succumb in the same way to an inoculation of minute doses of the virus, as for example, when one simply pricks them with a needle soiled with a pest culture. But then one does not find much localized edema at the point of inoculation, neither are there produced so large glandular tumefactions or buboes. These experiments explain human cases in which one frequently cannot discover any cutaneous lesion in the region tributary to the affected gland.

Passage from animal to animal raises the virulence of the microbe when passed through the same species but not when introduced into other animals. Thus a bacillus of exalted virulence for squirrels affects rabbits but slightly.

(B) Respiratory route. To cause a plague pneumonia it is sufficient to inject a few drops of a virulent culture into the trachea of a receptive animal. The Russian physicians in Bombay have thus produced fatal cases of plague in apes. The pneumonic form of human plague would thus seem to be due to the penetration of the virus into the lungs in the form of atmospheric dust.

Roux and Batzaroff have demonstrated that it is easy to give fatal plague to rats, guinea pigs and rabbits by placing upon their nasal mucous membrane a small number of plague bacilli grown upon a gelatine culture. One is thus better able to transmit plague from animal to animal than by subcutaneous inoculation. Thus intra-nasal inoculation with attenuated virus gives positive results when subcutaneous inoculation with the same virus is not sufficient to produce the death of the animal. At autopsy one finds a lobular or pseudo-lobular broncho-pneumonia with hemorrhagic spots upon the pericardium, peritoneum, stomach and kidneys. The spleen is covered with shining white granulations which are little masses of bacilli. As we shall see later the lesions are exactly the same as those of human plague pneumonia.

(C) Digestive route. It is possible to communicate the disease by the digestive tract by the ingestion of pure cultures of pest bacilli or fragments of the spleen or liver of an animal dead of plague.

According to Simpson, who investigated the matter at Hong Kong in 1901, most domestic animals will contract plague if they are fed upon infected material. The following may be infected by the digestive tract: apes, pigs, calves, buffaloes, sheep, chickens, ducks, geese, turkeys, pigeons and rats. In pigs the incubation is somewhat longer and may exceed one month.

It is very probable that the infection of animals by the digestive tract is not as it appears and that the penetration of the virus is made in reality through the nasal mucous membrane as was proven by the experiments of Simond and Batzaroff. (See later "Propagation of Plague From Rat to Rat.")

Certain birds, for example, vultures, seem to possess a complete immunity against plague. We know that in India the cadavers of the Parsees are exposed in what are called the "Towers of Silence," where the vultures go to devour them. During the plague epidemics which raged in Bombay none of the vultures of the "Towers of Silence" on Malabar Hill were affected by the epidemic.

Bacteriological diagnosis of plague. Thus we find in the presence of a case of suspected human plague that it is of the greatest importance to arrive at the exact diagnosis of the disease with the greatest possible rapidity in order to take measures for immediate preservation. The most common forms of the disease in man are the bubonic, pneumonic and septicemic. It follows that in the presence of one of these clinical forms one works with different fluids; lymph or pus from the buboe, sputum or blood. Each of these pathological products is submitted to the three following tests:

1. Smear, simple stain, Gram.
2. Culture, agar at low temperature.
3. Inoculation in the hind foot (rat or guinea pig.)

The microscopic examination of smears gives at once a good clue which the culture and inoculation transforms into a fact the next day or the day thereafter.

Serum diagnosis. The German Medical Commission sent to Bombay has demonstrated that the serum from the blood of plague patients exercises upon an emulsion of a pure culture o fthe plague bacillus the same agglutinating action that the serum of typhoid and cholera patients has toward the bacillus of Eberth and the comma bacillus.

Pseudo plague bacilli. We must be on guard against a possible error in the bacteriological diagnosis of rat plague. When an epidemic exists among the rats we should not conclude that it is inevitably plague. In fact there exists sometimes a special microbe which resembles morphologically the bacillus of Yersin and occasionally produces death in the rat. Neuman has called attention to the existence of this species. There arrived at Hamburg a ship on board of which was found a dead rat. The autopsy of the animal revealed the anatomical lesions which would make one think of plague—enlarged spleen, hypertrophied glands and foci of pneumonia

in the lungs. The bacteriological analysis isolated an organism resembling closely the bacillus of Yersin but the microbe was not pathogenic to the rat on ingestion. All of the other procedure of inoculation, particularly of the subcutaneous injection, which is so sensitive in the case of true plague, were without result. This was further confirmed by the agglutination test, the organism remaining indifferent on contact with pest serum.

According to Ganthier and Rayband, it is better for the serum identification to use an anti-pest serum which has not been heated. The ordinary therapeutic serum of the Pasteur Institute has been submitted to a certain amount of heat which lessens its agglutinating power.

Anti-Pest Substances.

Haffkine's anti-pest lymph. Haffkine's prophylactic is neither a serum nor a vaccine. It is not a serum because it is not made from the blood of any animal. It is not a vaccine because it does not contain the attenuated and living microbe as does the anti-anthrax vaccine and true vaccine, for example. Therefore the name of lymph suits admirably. Here is how Haffkine prepares his prophylactic lymph: a flask of two litres is filled with a certain amount of bouillon, upon the surface of which is floated some butter. The bouillon is sterilized and then planted with a culture of the bacilli.

The bacilli develop upon the under surface of the butter, sending forth numerous vegetations in the form of stalactites toward the bottom. Five or six times in the course of a month one lightly agitates the flask in such a manner as to precipitate to the bottom the major part of the culture. At the end of a month one satisfies himself that the culture has remained pure, then the liquid is drawn off into test tubes, which are sealed and heated for one hour at 70°. The contents of these tubes are used for inoculations. Before making the inoculations the tube is agitated so as to place in suspension the deposit from the fluid.

Haffkine inoculates from 3-3½cc. in an adult; 2-2½cc. in a woman; 1 cc. in a child of more than 10 years; 0.1-0.3cc. in young infants.

Our colleague, Calmette, spoke in the following terms of the method of Haffkine at the Congress of Rotterdam in 1901:

"I have been able to prove from the first," said he, "that the immunity after a single inoculation of 3cc. of a culture in bouillon one month old and heated for one hour at 70°, is not established for seven days. It lasts on the average three weeks in the guinea pig and one month in the ape, testing the resistance for these animals with the same dose of the same virus. In the rat the immunity is more durable after a single injection of 2cc. of a heated culture. In my experiment it has lasted as long as three months. It is therefore possible by Haffkine's method with a single inoculation with cultures killed by sufficient heating, in the great majority of cases to establish in man a sufficient immunity to permit him to pass through an epidemic of plague with immunity.

"Haffkine's vaccination should in consequence render the greatest service in infected countries because of the ease with which it is rapidly grown and by reason of the fact that great quantities of cultures may be produced almost without expense and because the inoculation of heated cultures, even though accompanied with a little pain in certain cases, is not followed by a prolonged incapacity for work."

(To be Continued.)

PUBLICATIONS

A Practical Treatise on Materia Medica and Therapeutics, with Especial Reference to the Clinical Application of Drugs. By John V. Shoemaker, M. D., LL.D., Professor of Materia Medica, Pharmacology, Therapeutics, and Clinical Medicine, and Clinical Professor of Diseases of the Skin in the Medico-Chirurgical College of Philadelphia; Physician to the Medico-Chirurgical Hospital, etc. Sixth edition. F. A. Davis Company, Publishers.

This work now appearing in its sixth edition is too well known to require any lengthy review to point out its merits. The last revision has necessitated many changes in the text, particularly in the direction of nomenclature and strength of preparations. Other notable changes have also been made. Part I of this edition is entirely new and deals with pharmacology in general; included in this portion is a table giving the changes in the strength of preparations and relative dosage, in the present Pharmacopeia and the one which preceded it. Among the new therapeutic agents discussed may be mentioned the Roentgen ray, Finsen light and vibrotherapy. The articles on serumtherapy, animal extracts and hydrotherapy are all suggestive, while that on electricity in medicine is excellent.

A. J. L.

Atlas and Text Book of Human Anatomy. By Dr. Johannes Sobotta, Professor of Anatomy in the University of Wurzburg. Edited, with additions, by J. Playfair McMurrich, A. M., Ph. D., Professor of Anatomy in the University of Michigan. Volume II. The Viscera, including the Heart. 214 illustrations, mostly in color. W. B. Saunders Company, 1906.

This volume is the immediate continuation of the first, and treats of the viscera. For purposes of convenience in dissecting the heart has been included in this book. Topographic anatomy as such has not been specially considered, but often, especially in the original illustration, the method of presentation is necessarily of a topographic character. So well known is Sobotta's Anatomy, particularly in the original, that it seems unnecessary to the reviewer to point out the excellence of the many illustrations produced by the artist, Mr. Hajek. The same methods of reproduction have been employed in this volume as in the first, namely autotype, multicolored lithography, and the three-color process. Explanatory figures and diagrams have been reproduced by simple line-etchings.

A. J. L.

Cosmetic Surgery. The Correction of Featural Imperfections. By Charles C. Miller, M. D. Second Edition Enlarged. 134 pages. Published by the Author, 70 State street, Chicago.

This small volume deals with an aspect of surgery somewhat remote from the interest of surgeons, but sooner or later featural surgery is destined to take its place as a recognized specialty. Left largely in the hands of "beauty specialists" and others of that tribe, advances in this field have been limited from want, in part, of adequate stimulus on the part of the medical profession. Fortunately here and there, a few at first looked upon askance have established reputations founded upon honest effort in the uplifting of practice of this kind. Among these may be mentioned the author of this book. "Four or five years ago ethical practitioners laughed or grew hostile when I mentioned my interest in elective surgery of the face for the correction of featural imperfections which were not actual deformities. Two years ago medical publishers refused to consider a manuscript upon the subject."